

Interfacing Modular IO Header M-EIP-H with Mitsubishi Scanner on EtherNet/IP Network

Quick Start Guide

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Scope of Document

This is a Quick Start Guide to interface Mitsubishi Electric India make Modular IO with Mitsubishi Communication Module (RJ71EIP91) and iQ-F FX5-ENET/IP on EtherNet/IP.

Prerequisites

1. GX Works3 Software version 1.043V or onwards.
2. EtherNet/IP configuration tool for RJ71EIP91/ FX5-ENET/IP
3. Modular IO setup
 - a. Modular IO Configurator Tool V1.5.0.0 or onwards.
 - b. Modular IO EDS file "M-EIP-H_0_1.eds"
Download Modular IO setup from Mitsubishi Electric India website.

References

- a. Modular IO User Manual [Manual Number: N16001AAMH]
- b. M-EIP-H - EtherNet/IP Object Classes, Messages and Services [Manual number: N18011AAMG03]
- c. iQ-R CPU User Manual [Manual Number: SH(NA)-081915ENG-A]
- d. iQ-F CPU User Manual [Manual Number: SH(NA)-082027ENG-A]

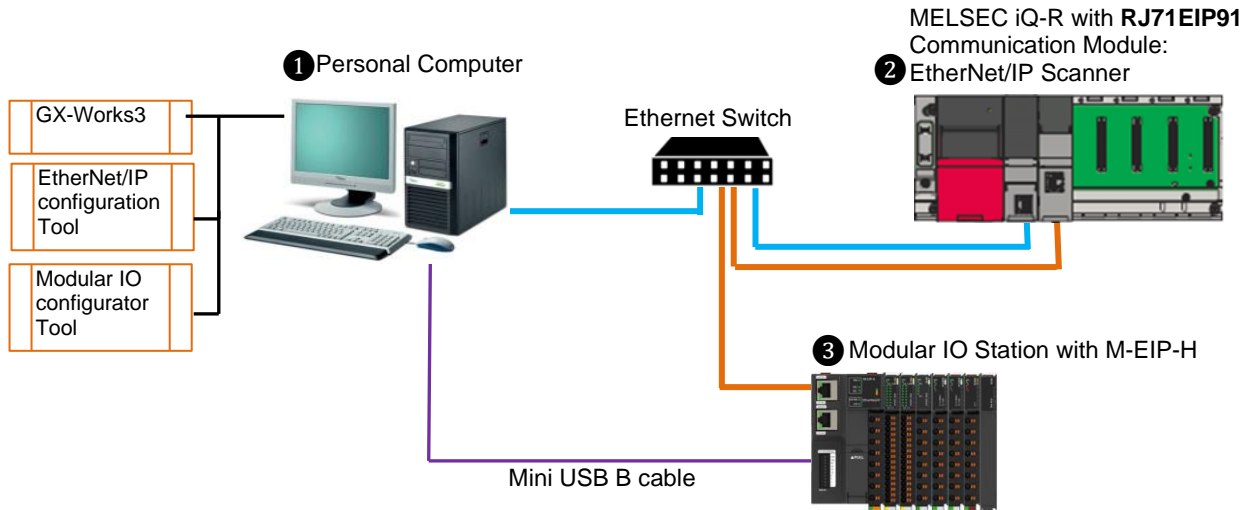
Follow the steps below to interface Modular IO with Mitsubishi Communication Module.

1. [Prepare Hardware Setup](#)
2. [Install "Modular IO Configurator Tool"](#)
3. [Configure Modular IO Station using "Modular IO Configurator Tool"](#)
4. [Configure Ethernet/IP Communication Module in "Engineering Tool" "GX-Works3"](#)
5. [Add M-EIP-H EDS File to "EtherNet/IP Configuration Tool"](#)
6. [Configure EtherNet/IP Network using "EtherNet/IP Configuration Tool"](#)
7. [Monitor IO Data, Status and Diagnostics](#)

Subsequent sections explain necessary steps in detail.

1 Hardware Setup

Setup diagram below shows setup with Mitsubishi iQ-R PLC with EtherNet/IP Communication Module (Scanner-RJ71EIP91) and Modular IO station with Header module M-EIP-H as an adapter.



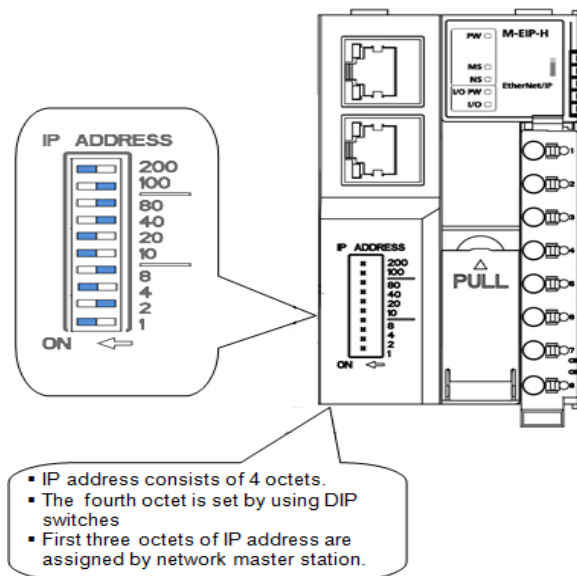
Modular IO station supports 2 Ethernet ports (ETH1 and ETH2; Layer 2 switch with DLR support). But scanner RJ1EIP91 supports 1 Ethernet port. User can connect any one port of Modular IO station to Ethernet/IP network.

Note: Setup for iQ-F PLC will include module iQ-F FX5-ENET/IP and required modules as applicable.

Setting of IP Address of Modular IO Station

Example shows DIP switch setting for value of 235.

$$235 = 200 + 20 + 10 + 4 + 1$$



Meaning of DIP switch positions:

Address	Descriptions
0 or >=255	IP address (all the four octets) are set as per parameter setting 'IP address' of modular IO configurator
1-254	4 th octet of IP address is set according to DIP switch

Note: It is necessary to power cycle Header module to effect the change in DIP switch setting.

2 Install Modular IO Configurator Tool

This is one-time activity. You should have following installer files stored at same location on your PC.

- a. ModularIOConfiguratorSetupx.x.x.x.exe
 - b. ModularIOCommunicationComponentx.x.x.x.exe
- x.x.x.x is a version of the software.

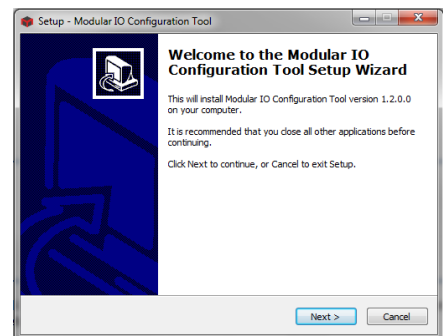
Software setup requirement:

Processor	Intel core i3 or Higher version
Disk space	200 MB
RAM memory	2GB or Higher
Screen resolution	1280 x 768 or Higher
Platform	Windows 7 (64 bit/ 32 bit)/ Windows 8 (64 bit)/ Windows 8.1 (64 bit)/ Windows 10 (64 bit)
USB interface	USB 2.0

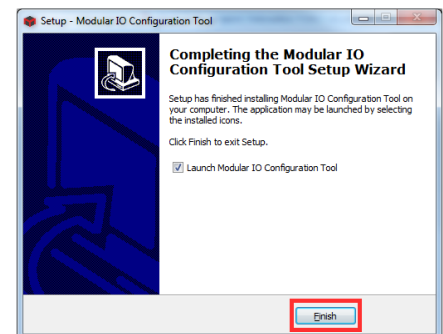
Following steps explain how to install Modular IO Configuration Tool

1. Run ModularIOConfiguratorSetupx.x.x.x.exe. It will open Modular IO Configuration Tool Setup wizard.

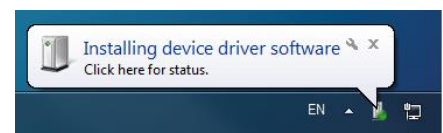
Click on Next button to complete installation of Modular IO Configuration Tool Setup, Communication Component Setup and Device Driver



2. Click on Finish button to complete Modular IO Configuration Tool Setup.



3. Connect the Modular IO Header module (M-EIP-H) to the machine using USB (2.0) cable. For the first time, the driver automatically is searched and configured. Please wait for few minutes while this step is executed.



4. Once the driver is successfully installed, following message will appear.



3 Configure Modular IO Station

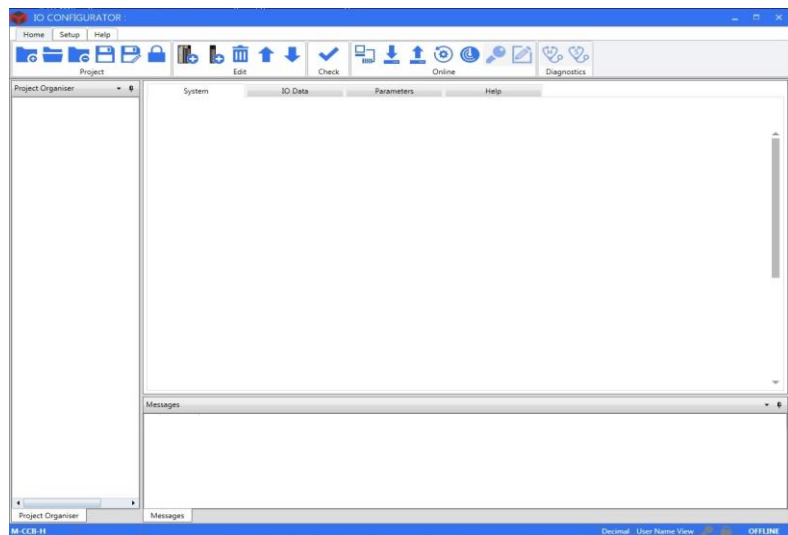
This section explains configuration and special features of Modular IO Configurator Tool.

Example here shows configuration of following modules.

Sr. No.	Module Code	Description	Qty
1	M-EIP-H	Modular IO Header: EtherNet/IP Adapter	1
2	M-16D	16 Digital Input, 24 VDC, Sink Type (Negative Common) Module	1
3	M-16TE	16 Digital Output, 24 VDC, Source Type Module	1
4	M-UAD2	2 Channel Universal Analog Input Module	1
5	M-DA2	2 Channel Analog Output Voltage/ Current Module	1

Following steps explain how to configure modular IO station in a Modular IO Configurator Tool.

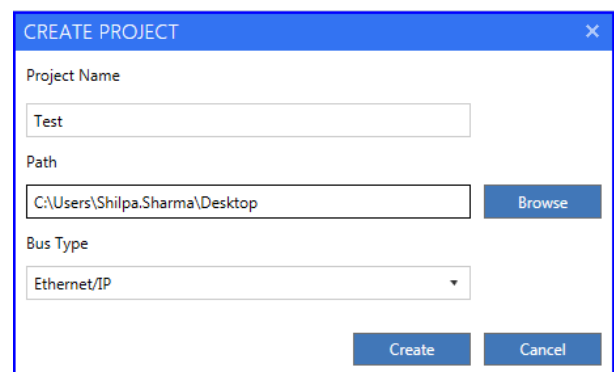
1. Open Modular IO Configurator Tool and view screen layout as beside




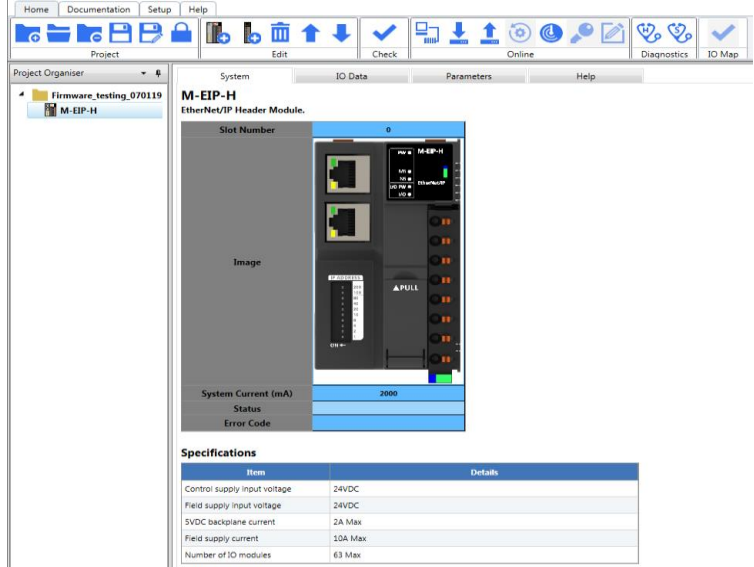
2. Click on  create new project.

This operation opens "Create Project" window.

Enter Project Name, Browse Path and Select Bus type as "Ethernet/IP".




3. Add and configure Header module.
Click on function  this opens Add Header dialogue box and Click on Add button.

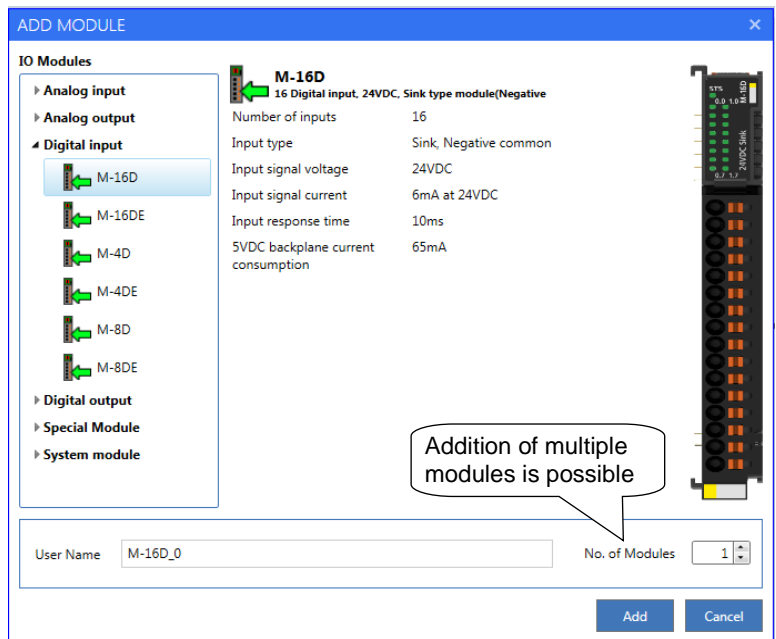


4. Select Header module from Project Organiser window and click on “Parameters” tab to set Header configuration parameters. User can modify Project Values for individual parameter.

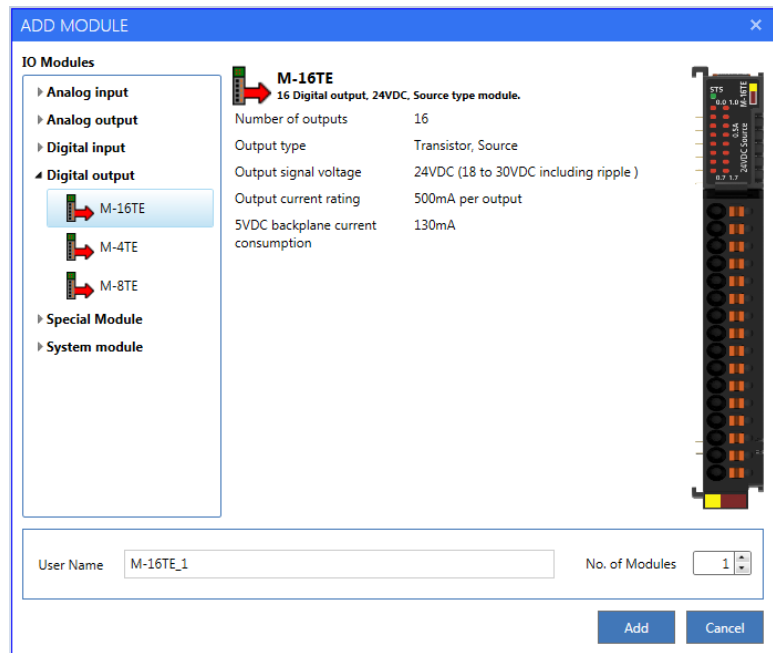
Parameter Name	Project Value	Online Value	Comment
General parameters			
IP address	192 . 168 . 3 . 253		Header IP address.
Subnet mask	255 . 255 . 255 . 0		Subnet mask.
Gateway address	. . .		Gateway IP address.
Action on fatal error	Stop N/W communication		Defines action on fatal error to any slot including header. Stop or continue communication with N/W master.
Output hold / clear	Clear		Defines output state of IO modules when disconnected from network or master CPU is not in RUN mode.

To set IP address on Modular IO station, refer section 1. Hardware Setup

5. Add and configure IO module to modular IO station. as below.
Click on function  to open dialog box of “Add Module” which shows list of IO modules grouped as per IO module type.
Select M-16D Digital Input module and click on Add button.

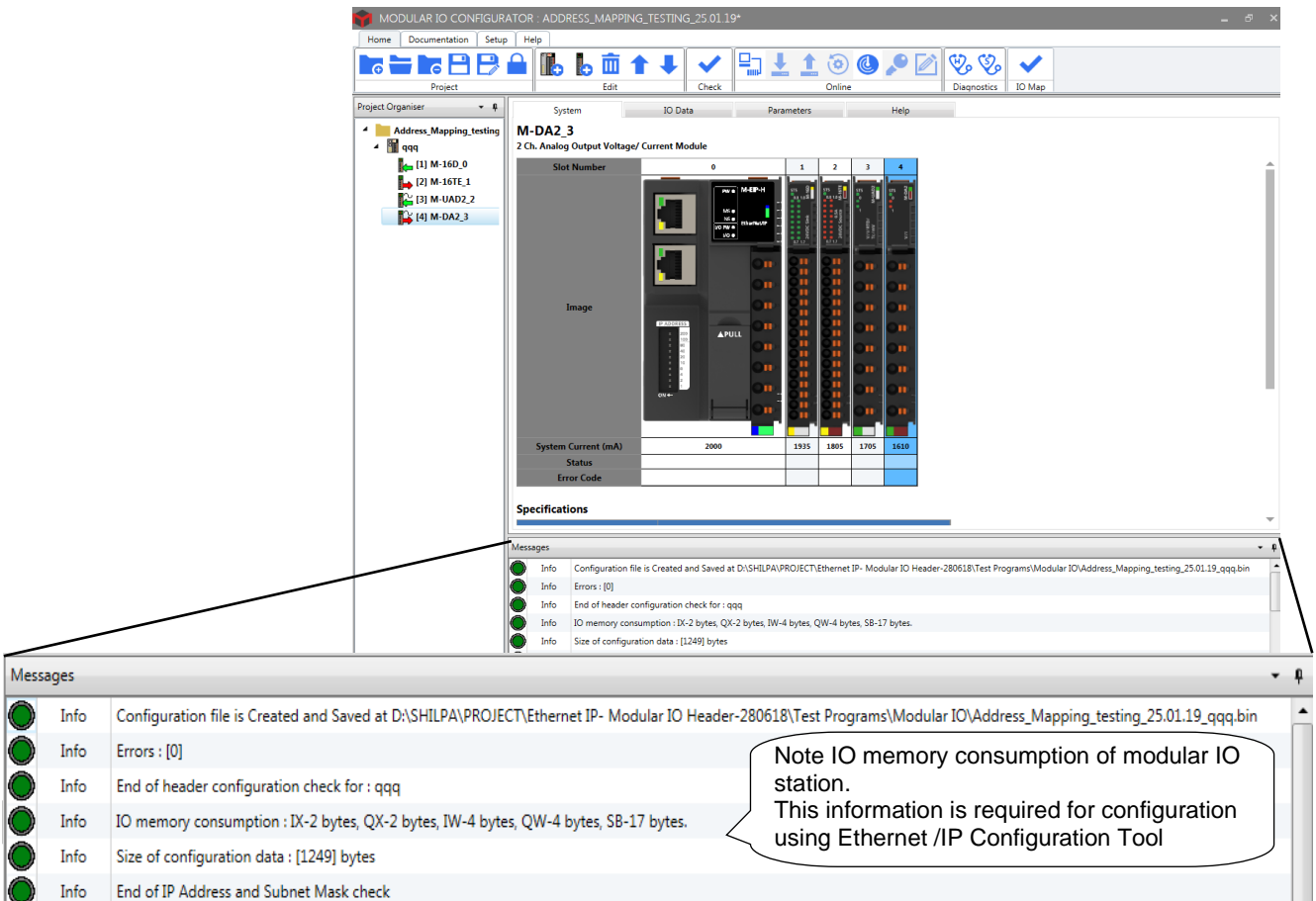


Select M-16TE Digital output Module and click on Add button.




Note: Follow the above procedure to add other modules as required.

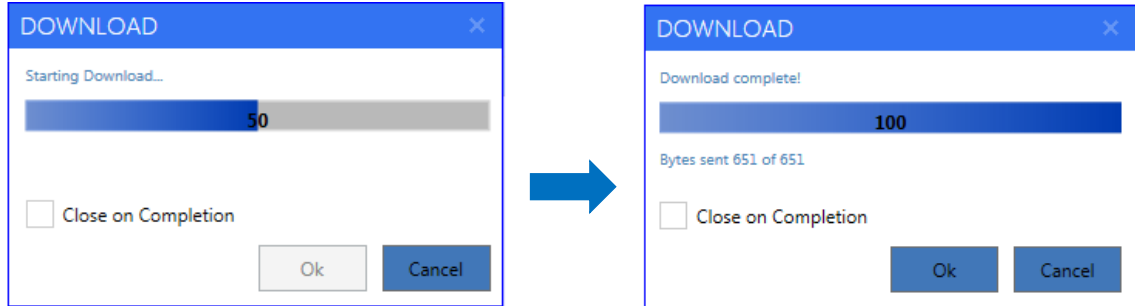
6. After adding and configuring all modules, 'Check' the project.



For IO configuration in the example,
 Input size (IX, IW, SB) = 23 bytes,
 Output size (QX, QW) = 6 bytes.

7. Configure Bus End module (M-BE) at the last slot position if there are 16 or more IO modules.
8. Connect Header module to your machine via standard USB cable.

Click on  to download the configuration to connected Header module. This pop ups progress window as shown below. After successful downloading, click Ok.

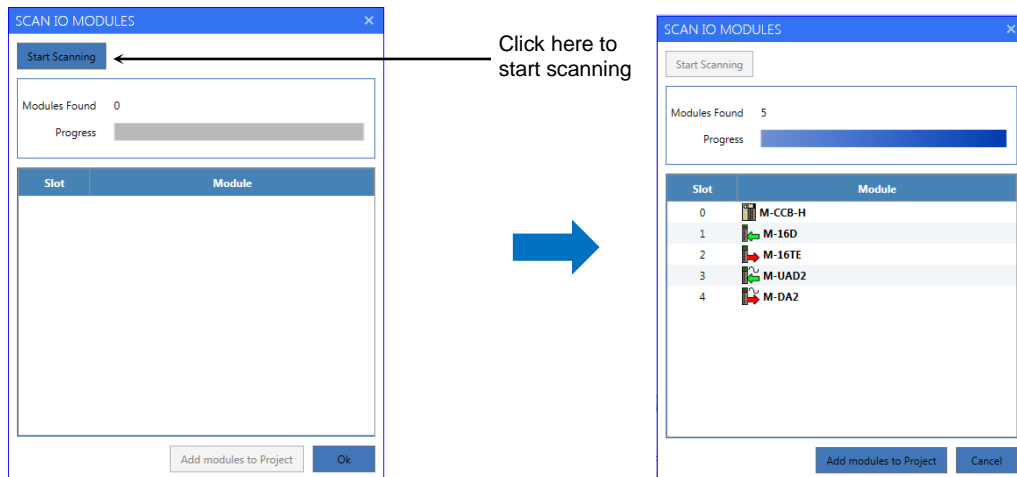


3.1 Special Features of Modular IO Configurator Tool

1. Scan IO modules connected to Header module:

Tool facilitates quick configuration of a modular IO station if setup is available with IO modules attached to the Header module. Using “Scan IO Module” function, tool can read the list of IO modules (other than system modules) physically attached to the Header module.

Select Header module and click on Online function  This opens following window of Scan IO Modules.



Add modules to project to add IO modules to the Header module by replacing existing IO modules if any.





NOTE:

System modules are passive modules. Hence, Header module cannot detect presence of System modules in a modular IO station. So, System modules do not appear in the list after scan.


2. Output test in online monitoring mode:



This is online feature and useful to test output module locally even when Header module is not connected to the fieldbus/ network. User can write individual output (True/ False to digital output module and channel data to analog output module) and test individual output.

Follow the steps as below, to write outputs for test purpose.

1. Click on function  to connect to Header module. Icon changes to  and Status bar is updated as ONLINE.
2. Enable output test by clicking on function . Icon changes color to red  and also updates status on status bar. This allows user to write force output values to actual output values. When Output test is enabled, IO LED on Header module turns yellow.
3. Select output module to test output and then select “IO Data” tab.
4. Select individual output DO nn (for Digital output) or CHn (for Analog output).
5. Select option as
 - Force to true/ Force to False/ No Force for Digital output and
 - Enter value between -32768 and 32767 for Analog output.

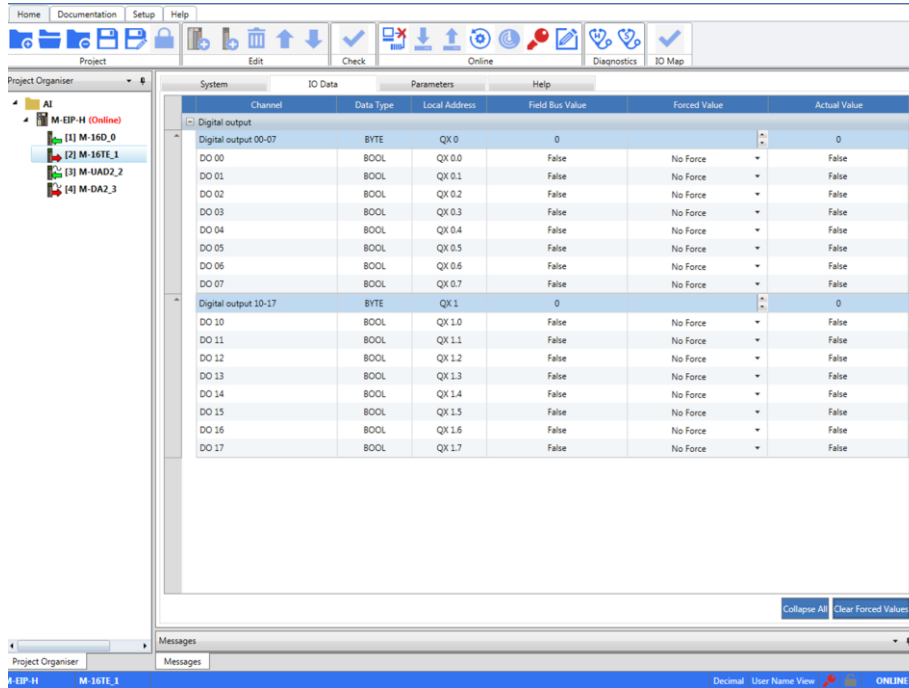
Color of Forced values change to red.

6. Repeat step 5 for other output module as required.
7. Click on Online function  to write Forced values to Actual values. Forced value overwrites Field bus values.
After writing output values to actual values, color of Forced values change to blue.
8. Change in digital output is indicated by output LED indication on the digital output module. User can measure actual output signal to test digital output and analog output

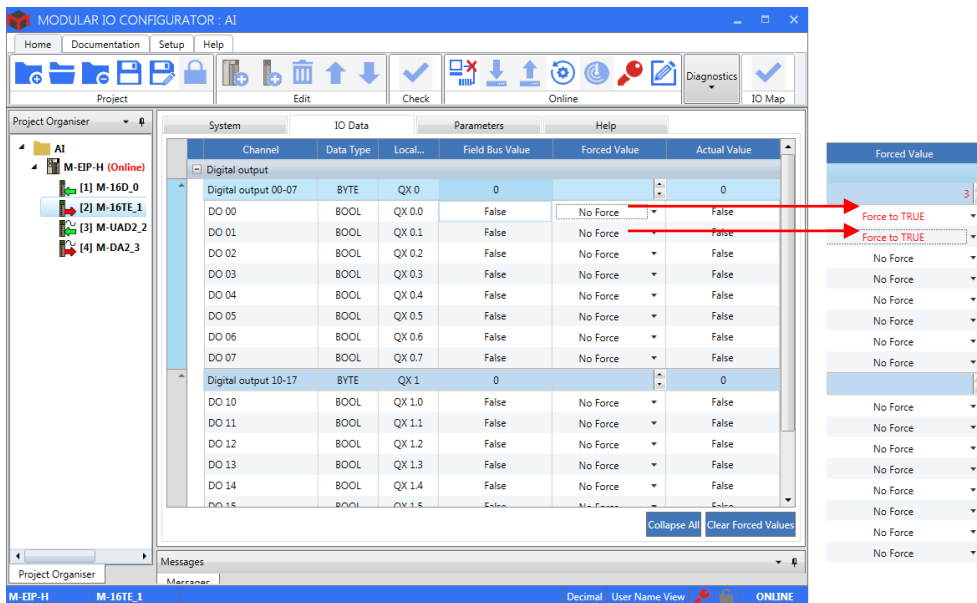
- For digital output, function “Enable/ Disable output test”  and “Write values”  are used as shown below.

In online monitoring mode, select digital output module, here M-16TE is selected as an example.


By default, forcing of output is disable.

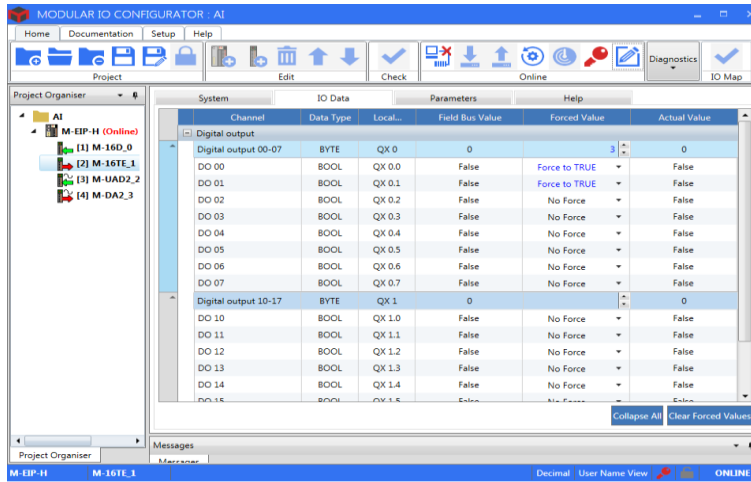


Click on function  Icon changes color to red . This enables output test feature and allows forcing of individual output as shown.



After selection of either Force to TRUE or Force to FALSE, online changed force value for output turns red as shown above.

Clicking on function  writes online changed force value to actual value and force value changes color as blue as below.



NOTE:

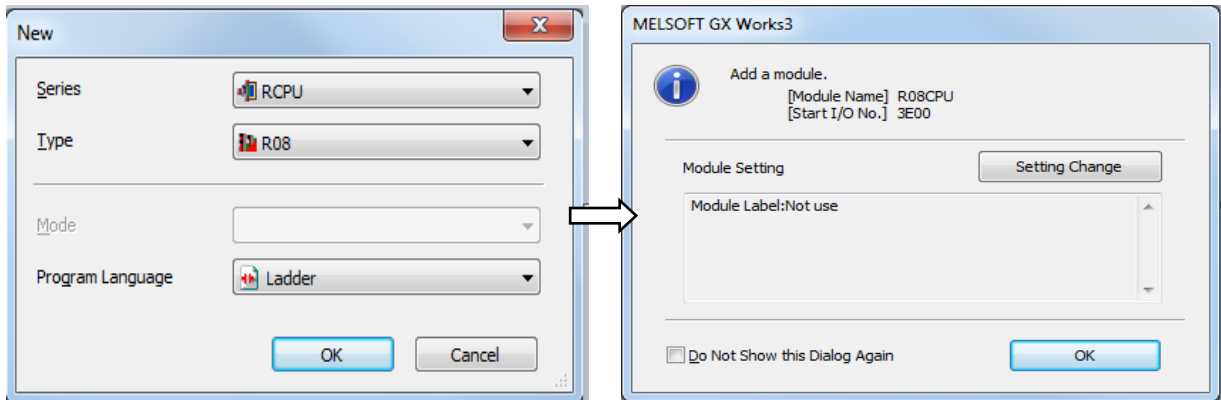
Output test is possible only if modular IO station is healthy. Confirm status of modular IO station using LED indications on Header module.

Forcing of output continues as long as modular IO station is powered on and in ONLINE monitoring mode. When user tries to go OFFLINE, tool prompt user to clear forced values.

4 Configure Ethernet/IP Communication Module

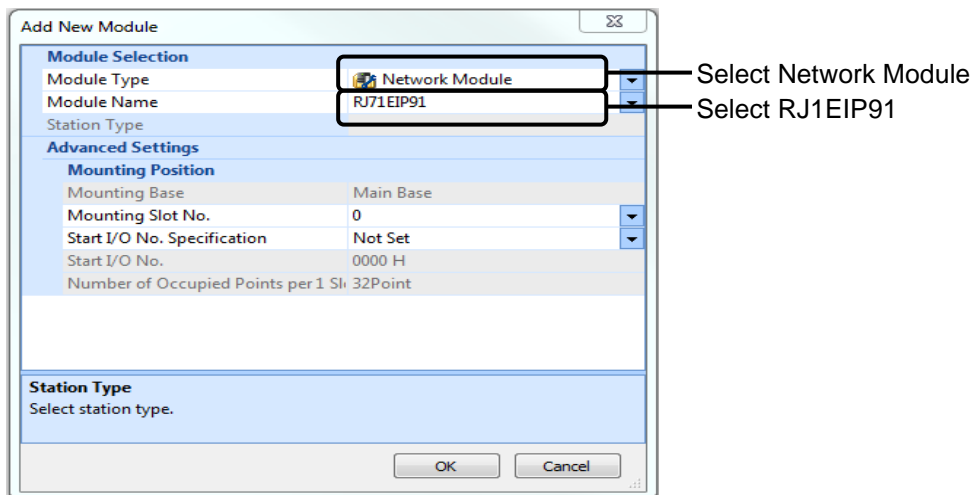
1. Open Engineering Tool GxWorks3 and create new project with selected CPU module as follow.

[Project] ⇒ [New]



2. Add Network Module RJ1EIP91 module as follow

[Navigation window] ⇒ [Parameter] ⇒ [Module Information] ⇒ Right-click ⇒ [Add New Module]



3. Set parameters of RJ1EIP91 as follow

[Navigation window] ⇒ [Parameter] ⇒ [Module Information] ⇒ [RJ1EIP91] ⇒ [Basic Setting]

Item	Setting Value
Various Operations Settings	
Mode Settings	Online
Own Node Setting	
Set the information of the own node such as IP address.	
IP Address Setting	
Set the IP address, subnet mask, and default gateway for the own node.	
IP Address	192.168.3.3
Subnet Mask	255.255.255.0
Default Gateway	

4. From application program turn ON output Y10 *1 (start EtherNet/IP communication) of RJ71EIP91.

*1 Address of Output Y10 will change depending on slot number of RJ71EIP91 and modules configured in base rack.

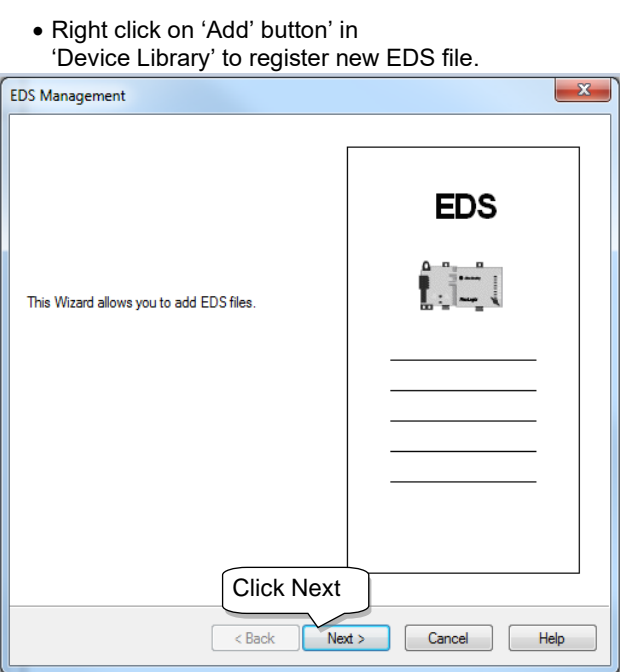
5. Download the configuration to CPU module. Now reset the CPU module or turn the system off and on.

[Online] ⇒ [Write to PLC].

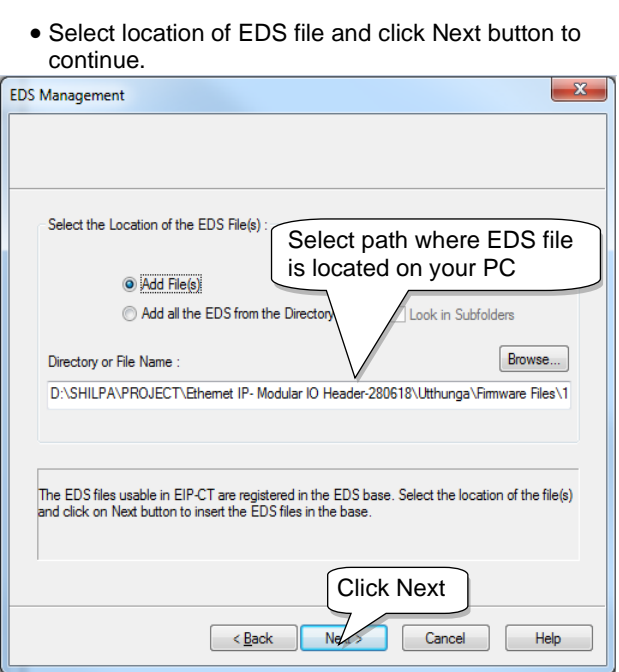
5 Add M-EIP-H EDS File to EtherNet/IP Configuration Tool

Following steps explain the procedure to add EDS file in EtherNet/IP Configuration Tool. This is one-time activity after installation of Tool.

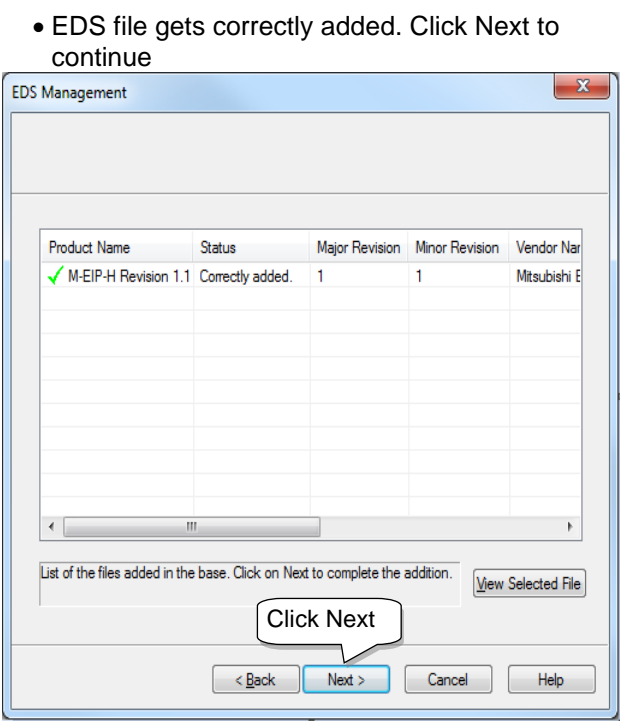
- Right click on 'Add' button' in 'Device Library' to register new EDS file.



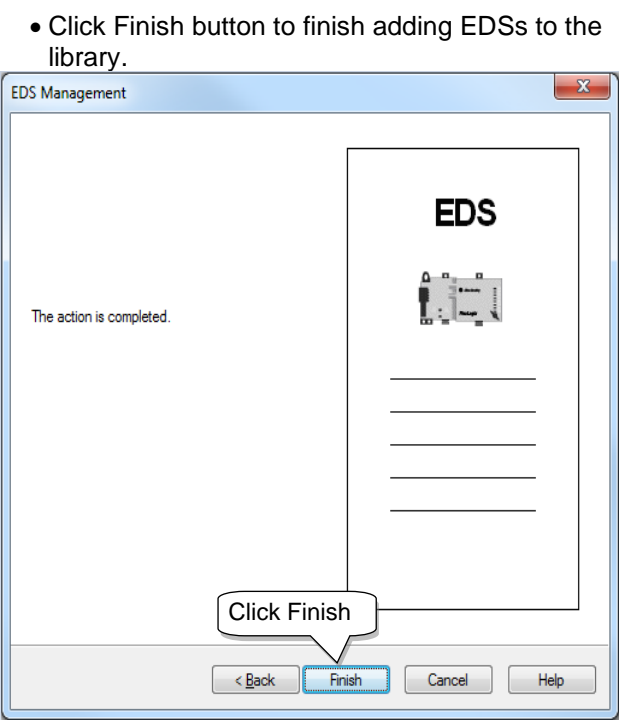
- Select location of EDS file and click Next button to continue.



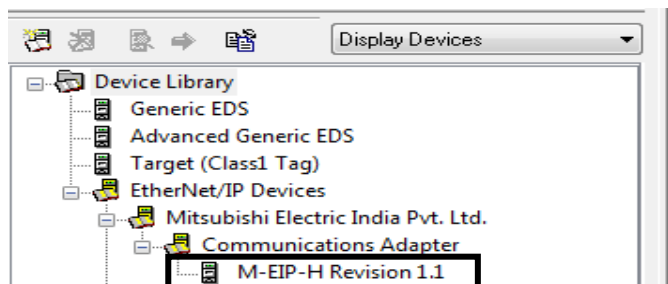
- EDS file gets correctly added. Click Next to continue



- Click Finish button to finish adding EDSs to the library.



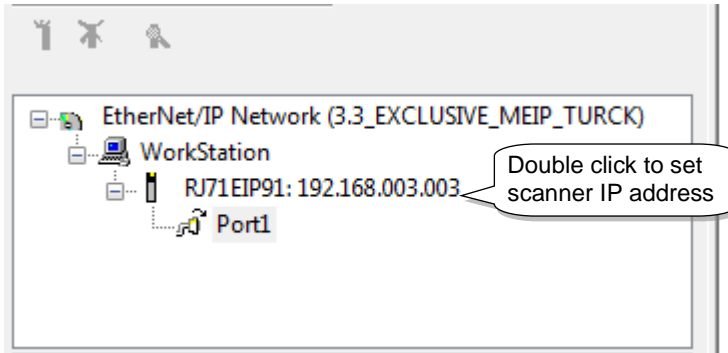
- After adding EDS to the Device Library, M-EIP-H device is shown under EtherNet/IP Devices in Device Library tab.



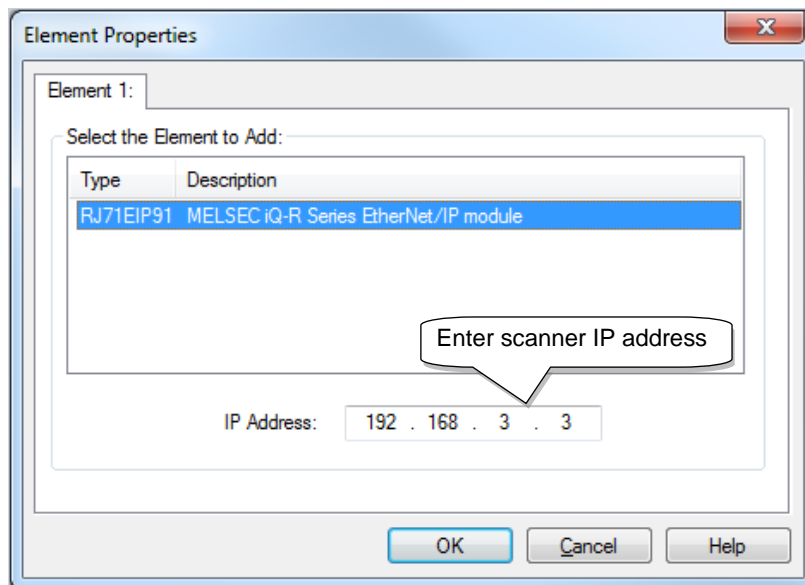
6 Configure EtherNet/IP Network Using Ethernet/IP Configuration Tool

1. Add scanner module to configuration from configuration description area.

Select "RJ71EIP91" in the EtherNet/IP setting ⇒[Description]⇒[Properties]

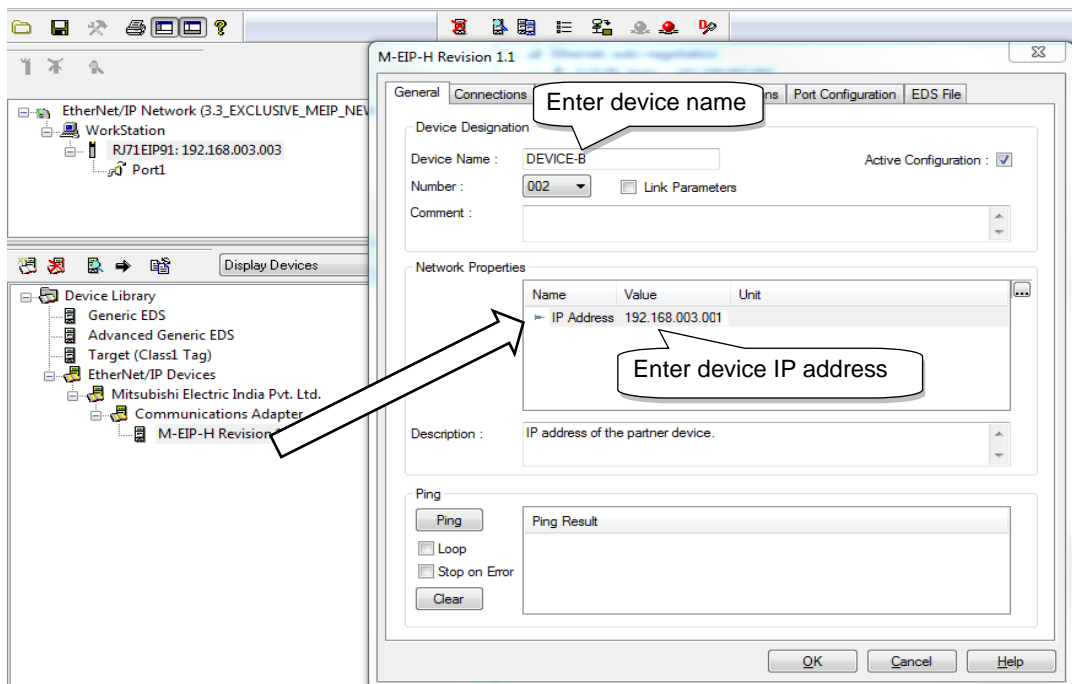


2. Set Scanner IP address

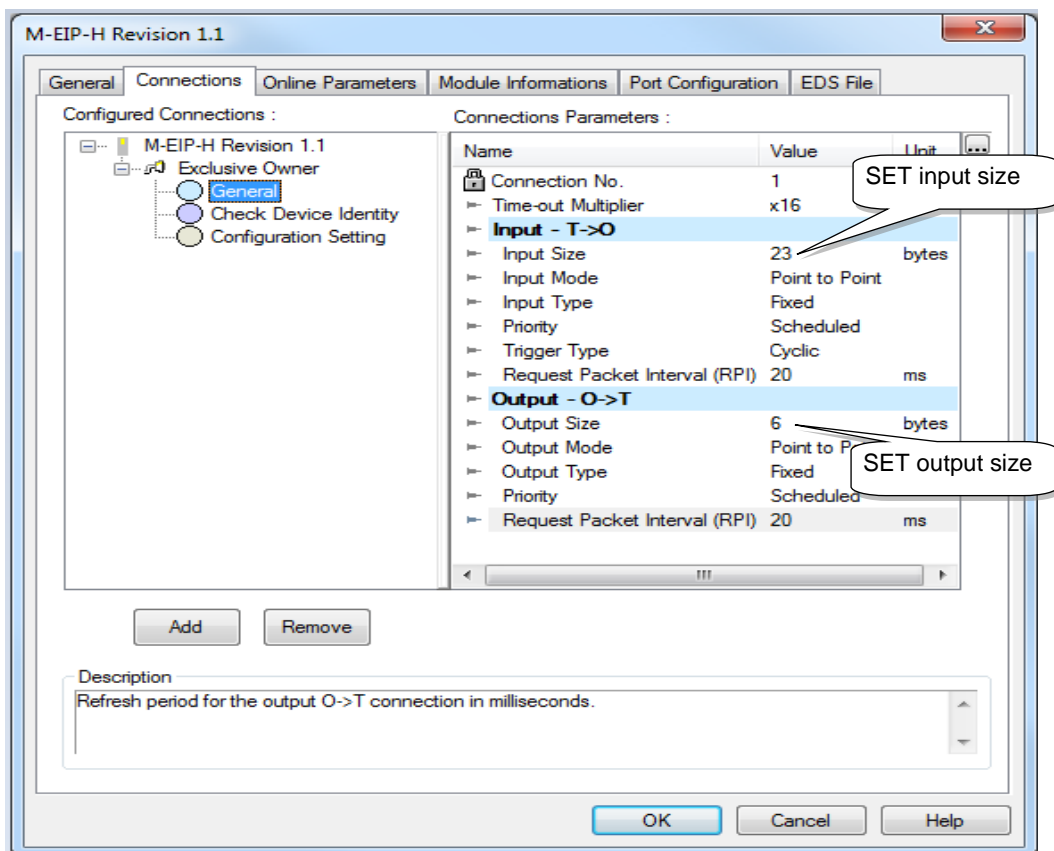


Note: Scanner IP address should be same as one configured in scanner configuration in GX Works3. Refer "[Section- 4 \(3\)](#)".

3. Drag and drop M-EIP-H module to protocol view area which will pop up dialogue as shown below

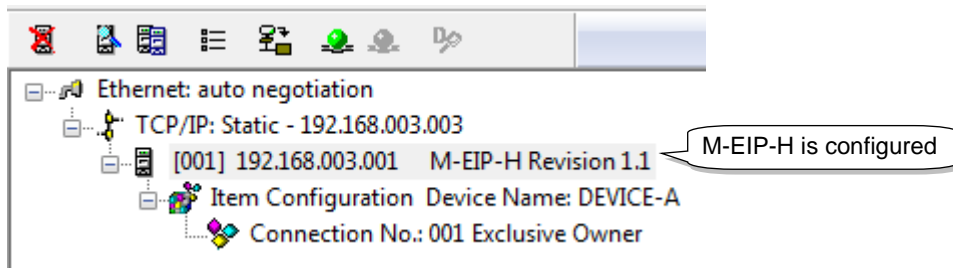



Then click on tab “Connections” to configure size of Input and Output.

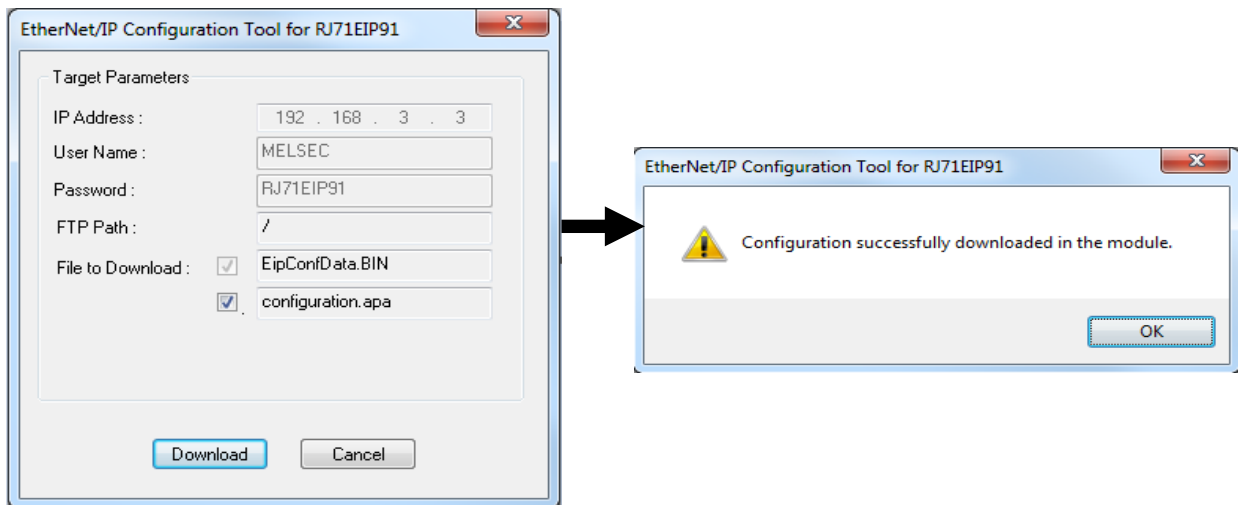


Note: Input size and Output size can be set as per IO configuration of Modular IO station. Refer “[Section- 3 \(6\)](#)”.

- 4. Now M-EIP-H device is configured



- 5. Click on  in Main Menu bar to download the configuration to scanner module. This pops up progress window as shown below. After successful downloading, click Ok



Note:

Reset of CPU module or power recycle of iQ-R PLC is necessary to apply changes in configuration of RJ71EIP91

7 Monitor Status, IO Data and Diagnostics

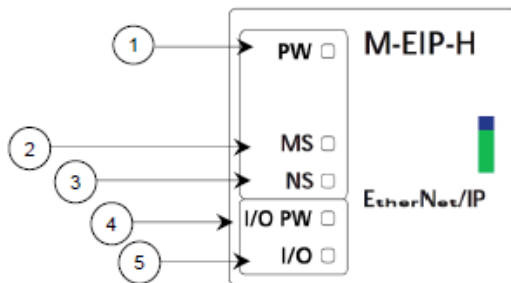
7.1 Monitor Network Status

Ethernet I/P network status for scanner and adapter stations can be monitored using

- LED indications on Header module
- Ethernet I/P Configuration Tool
- Engineering Tool GxWorks3
- Modular IO Configurator Tool

Using LED indications on Header module

Communication between Scanner and M-EIP-H is confirmed by LED indications on Header module. Refer LED label on Header module as below.



Sr. No	LED	Color	Status	Description
1	PW	Green	ON	System power to Header module is ON
2	MS	Green	ON	Device operational
3	NS	Green	ON	Device on-line and has at least one CIP connection established
4	I/O PW	Green	ON	Field power to Header module is ON
5	I/O	Green	ON	Header module is powered ON and communicating with IO module and no error is present.

Using Ethernet I/P Configuration Tool

Follow the steps below to monitor network status as explained below.

1. Switch Ethernet/IP Configuration Tool to the online state.

[File] ⇒ [Go Online]

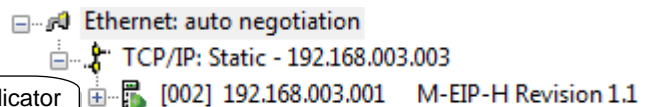
2. Enable diagnostic mode.

[Device] ⇒ [Diagnostic]

3. When the diagnostic mode is enabled, the connection status of EtherNet/IP devices is displayed in protocol view area as shown below.

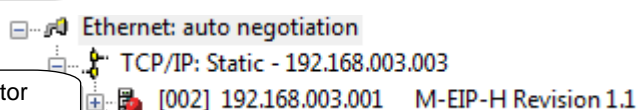
An EtherNet/IP device is connected, and EtherNet/IP communications are in progress.

GREEN status indicator near device icon.



An EtherNet/IP device is configured, but EtherNet/IP communications are not in progress.

RED status indicator near device icon.




Using Engineering Tool GxWorks3

The status of the Class1 communication and the error details can be checked with the following buffer memory areas.

- a. 'Data link status (Class1)' (Un\G27136 to Un\G27151)
- b. 'Error status (Class1)' (Un\G27152 to Un\G27167)
- c. 'Reserved station (Class1)' (Un\G27168 to Un\G27183)
- d. 'Class1 Connection Behavior Error status' (Un\G27392 to Un\G27647)
- e. 'Node information area' (Un\G28160 to Un\G28170)

Refer “MELSEC iQ-R CPU Module (Application) - SH(NA)-081915ENG-A” user manual for more details.

Using Modular IO Configurator Tool

Open configuration file and connect via USB port. Click on diagnostic function “Header Diagnostics”  to monitor EtherNet/IP diagnostic information of connected Header module.

Modular IO station provides 2 Ethernet ports (ETH1 and ETH2; Layer 2 switch with DLR support). But scanner RJ1EIP91 supports 1 Ethernet port. User can connect any one of the port of Modular IO station. Accordingly, diagnostics of the port can be monitored.

HEADER DIAGNOSTIC INFORMATION : [QQQ]

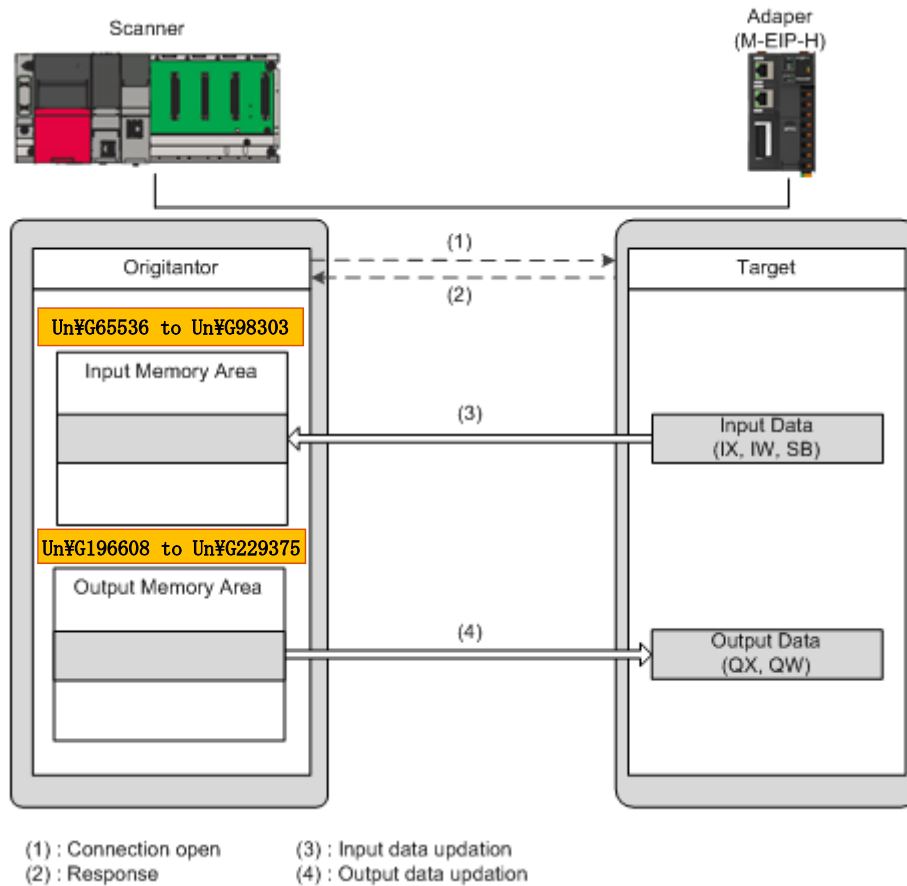
Expand All

	Diagnostics	Value	Description
+	Slots 48-63		
-	Interface (ETH1)		
	Interface status	1	Ethernet interface status (0 : Link down, 1: Link up).
	Interface speed	100	10MB or 100MB.
+	Interface (ETH2)		
-	Ethernet Link (ETH1)		
	Received byte count	6591008	Number of bytes received.
	Received unicast frames count	13564	Number of unicast frames received.
	Received non unicast frames count	4649	Number of non-unicast frames received.
	Sent byte count	6544459	Number of bytes transmitted.
	Sent unicast frames count	13309	Number of unicast frames transmitted.
	Sent non unicast frames count	0	Number of non-unicast frames transmitted.
	Large error count	0	Number of frames received with large frame error.
	Align error count	0	Number of frames received with alignment error.
	FCS error count	0	Number of frames received with CRC/FCS error.
	Receive error count	0	Number of frames with other receive errors.
	Single collision count	0	Number of frames transmitted after single collision.
	Multi collision count	0	Number of frames transmitted after multiple collisions.
	Drop count	0	Number of frames dropped after excessive collisions.
	Sent error count	0	Number of frames with other transmit errors.
+	Ethernet Link (ETH2)		
+	CIP Diagnostics		
+	DLR		

OK

7.2 Monitor IO Data

After communication between Scanner and M-EIP-H is established, IO data sharing between RJ71EIP91 and M-EIP-H will start as shown below.



The table below shows how Header memory IX, IW, SB, QX and QW is mapped to Input and output memory of scanner module.

Input memory area

Module	Buffer Memory Address	Byte 1	Byte 0
M-16D	Un\G65536	IX1	IX0
M-UAD2	Un\G65537	IW0	
	Un\G65538	IW1	
	Un\G65539	SB1	SB0
	Un\G65540	SB3	SB2
	Un\G65541	SB5	SB4
	Un\G65542	SB7	SB6
	Un\G65543	SB9	SB8
	Un\G65544	SB11	SB10
	Un\G65545	SB13	SB12
	Un\G65546	SB15	SB14
	Un\G65547		SB16

Output memory area

Module	Buffer Memory Address	Byte 1	Byte 0
M-16TE	Un\ G196608	QX1	QX0
M-DA2	Un\ G196609	QW0	
	Un\ G196609	QW1	

Note:

1. Refer **“MELSEC qi-R CPU Module (Application)- SH(NA)-081915ENG-A”** manual for buffer memory details.
2. In case of FX5-ENET/IP buffer memory will be as follow:



Input Memory Area : Un\G12000 to Un\G35999

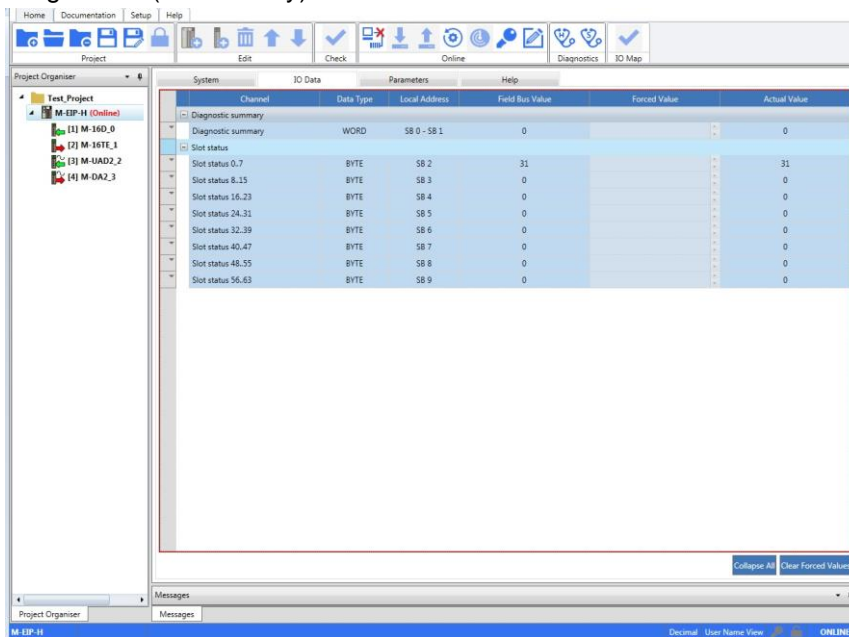
Output Memory Area : (Un\G60000 to Un\G83999)

Refer **“MELSEC I-F FX5-ENET/IP User's Manual: SH(NA)-082027ENG-A”** manual for buffer memory details.

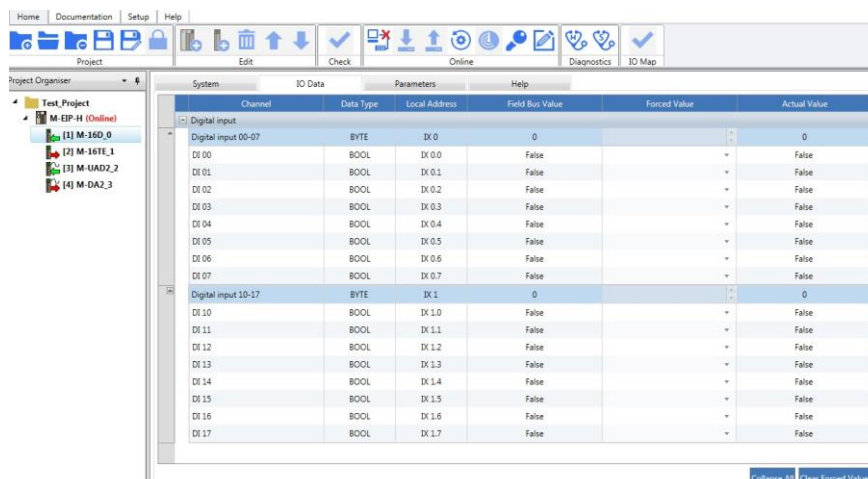
IO data can be monitored on individual Header module using Modular IO Configurator Tool

Following steps explain how to monitor IO data and diagnostics of a modular IO station in online mode,

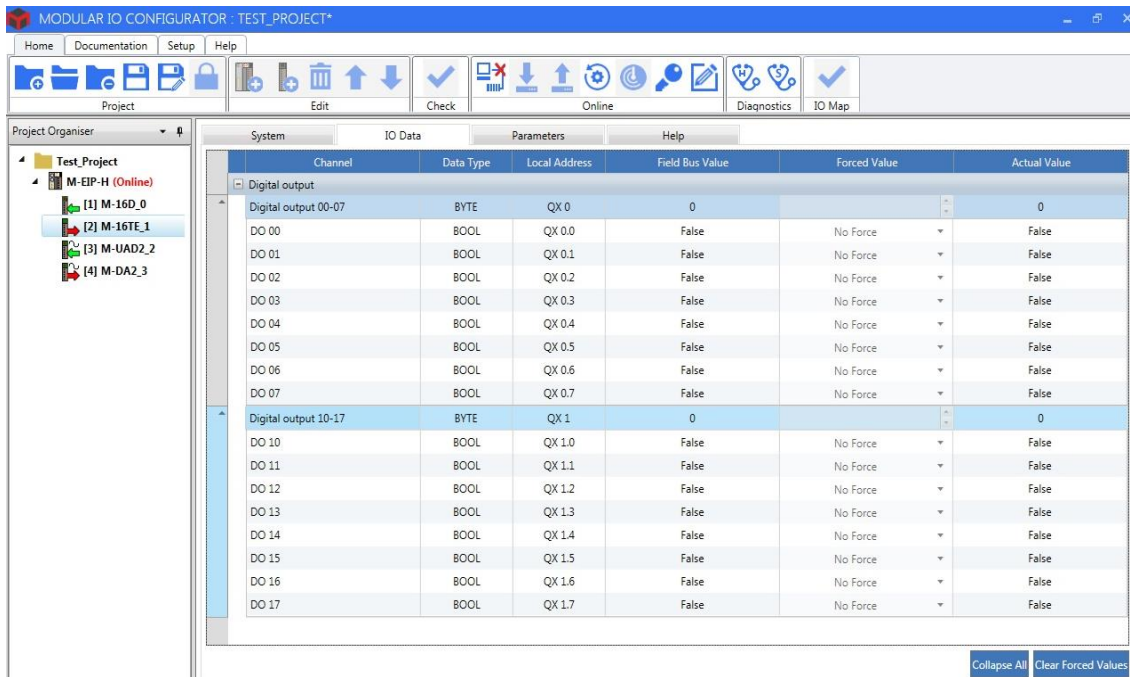
1. Click on function  to connect to Header module. Icon changes to  and Status bar is updated as ONLINE.
2. Select Header module in Project Organiser window and click on tab “IO data” to monitor diagnostics (SB memory) of Header module.



3. Select IO module in Project Organiser window and click on tab “IO data” to monitor IX of selected M-16D module.






- Select IO module in Project Organiser window and click on tab “IO data” to monitor QX of selected M-16TE module.



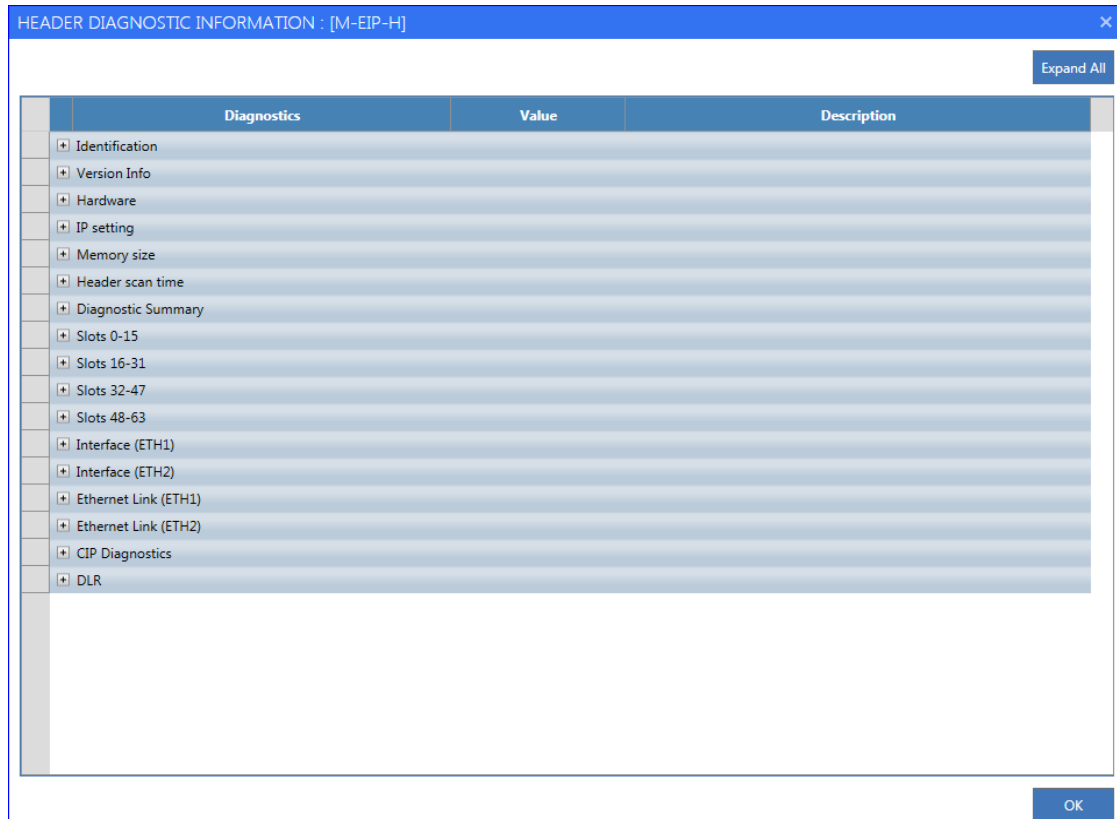
Note: Follow the above procedure to monitor IO data of M-UAD (IW) and M-DA2 (QW).

7.3 Monitor Diagnostics

Detailed diagnostics of Ethernet ports ETH1/ETH2 and each IO module in individual Modular IO station can be monitored locally as explained below.

1. Click on function  to connect to Header module. Icon changes to  and Status bar is updated as ONLINE.
2. Click on diagnostic function “Header Diagnostics”  for monitoring diagnostic information of connected Header module.

This pops up following window of “HEADER DIAGNOSTIC INFORMATION”.



Header diagnostics are categorized for easy monitoring. User can monitor individual parameter by expanding individual diagnostic as shown below.

The screenshot shows a window titled "HEADER DIAGNOSTIC INFORMATION : [QQQ]". It contains a table with columns "Diagnostics", "Value", and "Description". The table is organized into sections: "Diagnostic Summary", "Slots 0-15", "Slots 16-31", "Slots 32-47", "Slots 48-63", "Interface (ETH1)", "Interface (ETH2)", and "Ethernet Link (ETH1)".

Callouts point to specific parts of the interface:

- Station Diagnostics summary:** Points to the "Diagnostic Summary" section.
- Slot wise Status of IO modules:** Points to the "Slots 0-15" section.
- EtherNet/IP communication Diagnostic:** Points to the "Interface (ETH1)" and "Ethernet Link (ETH1)" sections.

Diagnostics	Value	Description
Diagnostic Summary		
No. of configured slots	5	No. of configured slots.
No. of detected slots	5	No. of detected slots.
Status	0	Bitwise status of header module.
Slots 0-15		
Detected	000000000011111	Bitwise module detection status.
Healthy	000000000011111	Bitwise module health status.
IO error	000000000000000	Bitwise status of module mismatch or absent.
COM error	000000000000000	Bitwise status of module COM error after power ON.
Fatal error	000000000000000	Bitwise status of module fatal error.
Non-fatal error	000000000000000	Bitwise status of module non-fatal error.
Slots 16-31		
Slots 32-47		
Slots 48-63		
Interface (ETH1)		
Interface status	1	Ethernet interface status (0 : Link down, 1: Link up).
Interface speed	100	10MB or 100MB.
Interface (ETH2)		
Ethernet Link (ETH1)		
Received byte count	137658	Number of bytes received.
Received unicast frames count	717	Number of unicast frames received.
Received non unicast frames count	49	Number of non-unicast frames received.
Sent byte count	2525360	Number of bytes transmitted.

- Slot diagnostic information provides configured modules and present modules, hardware versions and firmware versions of present modules, slot level error code, etc.

Click on function "Slot diagnostics" to monitor slot diagnostics.

This pops up following window of "SLOT DIAGNOSTIC INFORMATION".

The screenshot shows a window titled "SLOT DIAGNOSTIC INFORMATION : [M-EIP-H]". It contains a table with columns: Slot, Vendor, Configured..., Present Module, Ver. Configured Module, Ver. Present Module, HW Ver., FW Ver., Backplane Ver., and Error.

Callouts explain the columns:

- List of user names of Header module and IO modules configured:** Points to the "Configured..." column.
- List of user names of connected Header module and IO modules physically attached to the Header:** Points to the "Present Module" column.
- Hardware version of present modules:** Points to the "HW Ver." column.
- Firmware version of present modules:** Points to the "FW Ver." column.
- Error code of individual module along with error description in tool:** Points to the "Error" column.

Slot	Vendor	Configured...	Present Module	Ver. Configured Module	Ver. Present Module	HW Ver.	FW Ver.	Backplane Ver.	Error
0	1	M-EIP-H	M-EIP-H	1.1.0.0	1.1.0.0	1.0.0.0	0.0.0.1	0.0.0.8	0000
1	1	M-16D	M-16D	1.1.0.0	1.0.0.1	1.0.0.0	1.0.0.1	0.0.0.7	0000
2	1	M-16TE	M-16TE	1.1.0.0	1.1.0.0	1.0.0.0	1.1.0.0	0.0.0.3	0000
3	1	M-UAD2	M-UAD2	1.1.0.0	1.1.0.0	1.0.0.0	1.1.0.0	0.0.0.3	0000
4	1	M-DA2	M-DA2	1.1.0.0	1.1.0.0	1.0.0.0	1.1.0.0	0.0.0.3	0000

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Interfacing Modular IO Header M-EIP-H with Mitsubishi Scanner on EtherNet/IP Network

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